

1.1 Risk Conclusions Summary: honey bees

Tables 1.1 and 1.2 summarize the risk conclusions for honey bees associated with each crop or crop group¹ for which clothianidin and thiamethoxam (respectively) are registered. Conclusions are for on-field exposures and are expressed as red text indicate uses of clothianidin and thiamethoxam which pose risks to bees due to multiple lines of evidence. Green text indicates cases where the likelihood of adverse effects on bees from a particular use is considered low.

Multiple lines of evidence were considered to evaluate risk conclusions, including: multiple residue values (total food) above colony level NOAEC and LOAEC, estimated median and 90th percentile residues above colony level NOAEC and LOAEC, duration of residues above colony level endpoints on the order of weeks, magnitude of residues relative to endpoints suggests that substantial dilution of residues from uncontaminated food sources would be needed to prevent colony-level effects. Reported incidents were also considered.

Robust residue data sets are available for foliar applications to the following bee attractive crops and crop groups: cotton, cucurbits, citrus, stone fruit, pome fruit, tree nuts, berries, soybeans and ornamentals. Robust residue data sets are available for soil applications to cucurbits, citrus, and berries. In general, residues from soil treatments are lower than those from foliar treatments and seed treatment residues are lower than those from soil applications. Residues for cotton and cucurbits are used as surrogates for other non-woody crops with limited or no residue data (*e.g.*, root and tubers, mint). Residues for stone fruit, pome fruit and citrus are used for other woody crops (*e.g.*, tree nuts, tropical fruits).

In general, if a crop is attractive to bees and there is potential for exposure, on field risk is expected from pre-bloom, foliar applications. The on field risk from soil applications varies by use. In general, soil treatments pose a low risk; however, there are some limited exceptions. For uses with risk, the weight of evidence is characterized in terms of its robustness.

Uses with Low On Field Risk:

This assessment concludes that the following crops and crop groups pose a low risk to honey bees because they are harvested prior to bloom (according to USDA 2017) and have limited on-field exposure to bees: bulb, leafy and brassica leafy vegetables; artichoke and tobacco. Therefore, any type of applications (*i.e.*, foliar, soil or seed) to these crops would pose a low on-field risk to bees.

This assessment concludes that the following crops and crop groups pose a low risk to honey bees because they are not attractive to honey bees (according to USDA 2017) and have limited on-field exposure to honey bees: root and tuber vegetables (except sweet potato, Jerusalem artichoke, edible burdock, dasheen and horseradish), fruiting vegetables (except roselle, okra, chilies and peppers). Therefore, any type of applications (*i.e.*, foliar, soil or seed) to these crops would pose a low on-field risk to bees.

For seed treatment uses that are not harvested prior to bloom and are attractive to bees, there is a low risk from exposures of clothianidin and thiamethoxam to bees. These conclusions are based on available

¹ Crops groups are codified in 40 CFR 180.41 and can be found here: <https://www.ir4project.org/crop-grouping/>

empirical residue data for seed treated crops (i.e., corn, cotton, canola and soybeans) and bridging to other crops receiving seed treatments. Although the default BeeREX RQs are above LOCs, the majority of refined RQs (with empirical residues) are below LOCs. For clothianidin, the following uses had refined Tier I RQs above the LOCs for adult bees: canola, cereal grains, legumes, sorghum and soybeans. When residues were compared to the Tier II honey bee colony endpoints, residues were all below the NOAEC, indicating low risk of colony level effects. For thiamethoxam, the following uses had refined Tier 1 RQs above the LOC for adult bees: beans, cucurbits, legumes, lentils, peanuts, peas, sorghum, soybeans and sunflower. All uses had residues below the clothianidin and thiamethoxam colony level NOAEC (both are considered because both chemicals are part of thiamethoxam's residues of concern), with the exception of cucurbits. The weight of evidence indicates a low risk from thiamethoxam seed treatments to cucurbits. In summary, a low risk call is made for on field exposures associated with all clothianidin and thiamethoxam seed treatment uses.

Foliar applications that are made post-bloom (i.e., for orchard crops and berries) pose a low risk of on-field risk for both chemicals. This is based on residue data for woody crops that were based on post-bloom applications. Residues were below colony level endpoints, indicating a low risk to honey bee colonies. Similarly, there is a low risk call for foliar applications to soybeans. This is also based on empirical residues in soybeans that are below colony level endpoints.

Uses With On Field Risk and Most Robust Weight of Evidence:

The following uses represent a risk to honey bee colonies and have robust weights of evidence:

- Foliar applications to cotton of clothianidin and thiamethoxam;
- Foliar applications to cucurbits of clothianidin and thiamethoxam;
- Foliar, pre-bloom applications of thiamethoxam to orchard crops (i.e., citrus; pome, stone and tropical fruits; tree nuts);
- Foliar, pre-bloom applications of clothianidin to grapes;
- Foliar, pre-bloom applications of thiamethoxam to berries.
- Soil, applications of clothianidin (regardless of timing) and
- Soil, pre-bloom applications of thiamethoxam to citrus.

In addition to robust residue data sets that cover several chemicals and crops within the groups indicated above, residues from these types of applications tend to be 1-2 orders of magnitude above colony level endpoints (i.e., NOAEC and LOAEC values), and exceed on the order of weeks to more than a month. For several of these uses, incident reports are available (i.e., clothianidin used on cotton; thiamethoxam use on orchards).

Uses with On Field Risk and Moderately Compelling Weight of Evidence:

Similar to above, multiple lines of evidence were considered to evaluate risk conclusions, including: multiple residue values (total food) above colony level NOAEC and LOAEC, duration of residues above colony level endpoints on the order of weeks, magnitude of residues relative to endpoints and incident reports. The uses listed in this section are identified as posing a risk to honey bee colonies; however, for varying reasons, the weight of evidence for these. Each call has a different weight of evidence that is considered moderately compelling.

For clothianidin, applications to the following crops and groups represent a risk:

- Foliar and soil applications to honey bee attractive root and tubers (sweet potato, Jerusalem artichoke, edible burdock, dasheen and horseradish),

- Soil applications to cucurbits;
- Foliar applications to pomegranate
- Foliar and soil applications to ornamentals and
- Foliar applications to turf (residential).

For clothianidin, multiple incident reports are available following residential/urban soil drench uses on trees/shrubs as well as uses on turf.

For thiamethoxam, foliar applications to the following crops and groups represent a risk:

- Foliar and soil applications to honey bee attractive root and tubers (sweet potato, Jerusalem artichoke, edible burdock, dasheen and horseradish),
- Foliar and soil applications to honey bee attractive fruiting vegetables (roselle, okra and chilies and peppers),
- Foliar applications to mint,
- Foliar and soil applications to ornamentals and
- Foliar applications to turf (residential).

Uses with On Field Risk and Least Compelling Weight of Evidence:

There is also potential risk to honey bees from post-bloom, soil applications of clothianidin and thiamethoxam to berry crops. Exposure is estimated using limited available berry residue data for this application scenario and orchard residue data. The two data sets represent conflicting lines of evidence, i.e., the berry data do not exceed colony level endpoints whereas orchard residue data do exceed. There is uncertainty in the representativeness of orchard crops for berries.

In addition, there is risk of thiamethoxam from soil applications to cucurbits; however, the weight of evidence is limited. The magnitude of exposure is between the NOAEC and LOAEC values and only exceeds the NOAEC for a limited number of residues.

Although on-field risk was precluded for almost all seed treated, risk was not able to be precluded for seed-treated root and tuberous vegetables that are attractive to honey bees. Specifically, for clothianidin, turmeric was identified as an attractive root and tuber crop species that, based on application rate and the estimated residues developed from the seed treatment residue bridging document (**Attachment 4**), there was potential on-field risk to honey bees foraging on attractive turmeric flower parts following seed treatment. A conclusion of risk for this use site was considered highly uncertain, due to the differences associated with clothianidin seed treatments for turmeric (where an entire seed piece or rhizome is treated) compared to other seed treatments where only the seed itself is treated. The seed treatment residue bridging is based solely on empirical data from treated seeds themselves. The relevancy of exposures from this application method to one where a piece of root/rhizome is treated is considered highly uncertain and exposures could be lower or higher than that predicted by the seed treatment bridging analysis.

Off Site Risk Conclusions:

Based on a Tier I analysis, for foliar applications, off-field dietary risks to individual bees exposed to spray drift extend 1000 feet from the edge of the treated field. There is uncertainty in this conclusion which includes: assumption of available attractive forage off field, individual level toxicity data, BeeREX default estimates for residues, and AgDRIFT™ modeling.

Soil applications are assumed to have a low off-field risk because of low potential to drift.

In regards to seed treatments, there are risk concerns for potential off-site transport of contaminated dust at the time of planting. This concern is supported by multiple bee kill incidents for both clothianidin and thiamethoxam that are associated with the planting of treated seed, in particular corn.

Additionally, soil amendments of clothianidin-treated poultry litter (from the use in poultry houses) also pose a risk when applied to fields with honey bee attractive plants (*e.g.* pasture).